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Incidence of congenital gallbladder anomalies and clinical significance

Gall bladder anomalies

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Abstract
Aim: In this study, we aimed to investigate the prevalence of congenital gall bladder anomalies and their importance in perinatal follow-up.
Material and Methods: This study was conducted by retrospectively examining the data of 3080 patients who applied to Firat University Gynecology and Obstetrics Outpatient Clinic between 14-37 weeks of gestation between December 2018 and November 2020. Obstetric characteristics of the patients such as age, pregnancy number, abortion, parity and body mass index were recorded. In all cases, the fetal gallbladder was examined in the axial plane, used to measure the abdominal circumference. Routine evaluation was performed in the axial plane of the abdomen, where other structures such as the stomach and umbilical vein were visible in this plane. After monitoring the gall bladder, the echogenicity of its contents, the shape of the sac and its position in the abdomen were evaluated. The ultrasonographic features of the cases with gallbladder abnormalities detected were recorded.
Results: Between the dates of the study, 2120 pregnant women were included in the study. Gallbladder abnormality was detected in five cases. Accordingly, the incidence of gallbladder abnormalities was found to be 0.23%. The incidence of gall bladder abnormalities in the study population was found to be 1/370. Gallbladder abnormality was isolated in all cases, and no chromosomal abnormality was found. No additional anomalies were found in newborn babies in the postpartum controls of the cases.
Discussion: Gallbladder evaluation is part of extended fetal screening. Gallbladder anomalies appear as relatively rare and mostly benign anatomical variations. By informing the family, it is ensured that appropriate follow-up in postnatal life is obtained.

Keywords
Gall Bladder; Anomalies, Ultrasonography; Incidence

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Introduction

Congenital gall bladder anomalies are extremely rare anomalies. They can be part of an isolated, chromosomal, and syndromic condition. Although not an integral part of the prenatal examination, the American Institute of Ultrasonography (AIUM) has recommended the evaluation of the gallbladder in its detailed fetal anatomical ultrasonography recommendations since 2017 [1]. The frequency of gall bladder anomalies is generally not included in the literature. However, the prevalence of gallstones was reported as 4.7 per 1000 births [2], the prevalence of bladder duplications as 1 in 4000 births [3], or the prevalence of bladders not permanently observed in the fetal examination as 1 out of 875 births [4]. On sonographic examination, the fetal gall bladder appears as a mostly pear-like anechoic structure in the right upper abdomen, to the right of the intrahepatic part of the umbilical vein. The gall bladder can normally be detected in all cases in the second trimester of pregnancy and its sizes from 13 weeks to term have been published [5]. Most of the gallbladder anomalies are benign in nature and their relationship with chromosomal and structural anomalies has not been clearly revealed. There is gallbladder growth arrest, most likely as part of the severity of the anomaly, and most cases have abnormalities in more than one organ [6, 7]. However, in the presence of genetic diseases such as cystic fibrosis, failure of monitoring the gall bladder may be the only warning sign [8].

In this study, we aimed to examine the gall bladder anomalies detected in our study.

Material and Methods

The study was conducted on pregnant women who were in the second or third trimester of pregnancy, and applied to the outpatient clinic for routine fetal evaluation. Written consent was taken from all pregnant women for fetal ultrasonography examination. After the approval of the local ethics committee (Board decision number 2019/10/01), the records of the pregnant women who underwent fetal examination between December 2018 and November 2020 were retrospectively reviewed. The obstetric characteristics of the cases such as age, number of pregnancies, parity, body mass index were recorded. Cases with major congenital anomaly, cases with a high risk (1/270 and above) in combined or triple test, and cases with multiple pregnancy were excluded from the study. Gestational age was determined according to the last menstrual date in cases with regular menstruation and according to the first period crown-rump distance in other cases. The ultrasonographic examination of all fetuses was performed by the same physician, who is an expert in maternal-fetal medicine. Transabdominal route was used for sonographic examinations. Broad band convex 2-6 MHz multi-frequency high-resolution ultrasonography device (Voluson E6 BT 18, General Electric, Zipf, Austria) was used for the examination. In all cases, the fetal gallbladder was examined in the axial plane, used to measure the abdominal circumference. Routine evaluation was performed in the axial plane of the abdomen, where other structures such as the stomach and umbilical vein were visible in this plan. After monitoring the gallbladder, the echogenicity of its contents, the shape of the bladder and its position in the abdomen were evaluated. In the right upper quadrant of the fetal abdomen, the presence of a typically pear-shaped, anechoic structure was considered normal gallbladder, while any echogenic structure, shape anomaly and deviation in the location were considered abnormal and the findings were recorded.

Statistics

The evaluation of the data was made with the SPSS 21.00 program. Descriptive statistics were used.

Results

Records of 3080 cases who underwent fetal examination between December 2018 and November 2020 were reviewed. When cases with major anomalies or high- risk screening tests were excluded, 2120 cases were included in the study. The cases examined were between 14-37 weeks of gestation. The gallbladder was evaluated as abnormal in 5 cases between the dates of the study. When the patients in the second period of pregnancy were examined, the mean week of gestation of the patients was found to be 21.16 ± 1.24. When the patients in the third period of pregnancy were examined, the mean week of gestation was found to be 36.25 ± 1.29. The ages of the patients were between 19 and 42, and the mean age of pregnant patients who were examined was 26.19 ± 4.56 years. The mean number of pregnancies of the patients was 2.34 ± 1.56, the mean number of parity of the patients was 1.17 ± 1.41, the mean number of abortions of the patients was 0.4 ± 0.8 and the the mean number of curettage of the patients was 0.07 ± 0.21. Obstetric characteristics of the patients are shown in Table 1.

When gallbladder anomalies were examined among 2120 cases, in 1 case (22 weeks gestation), the gallbladder duplication was detected (0.05%) (Figure1), in 2 cases (22 and 24 weeks of gestation), the gallbladder was not observed (0.09%) and in 2 cases (21 and 34 weeks gestation) bile sludge was detected (0.09%) (Figure2).

When all cases are considered, the frequency of fetal gallbladder anomaly was found as 0.23%. Chromosomal anomaly or additional anomaly was not found in any of the 5 cases with gallbladder anomaly, and the cases were considered isolated anomalies. It was detected from the patient records that five cases had normal postpartum examinations. Two cases gave birth in an external center. These cases were reached by phone after delivery. It was learned that no additional findings were found in the babies, and there was no finding of chromosomal

Table 1. Demographic and obstetric characteristics of the patients.

Characteristics	Minimum-Maximum	Mean ± Standard Deviation
Age (Year)	19-42	26.35±4.86
GA (Second trimester, weeks)	14-27	21.16±1.24
GA (Third trimester, weeks)	28-38	36.25±1.29
Gravidy	1-5	2.34±1.56
Parity	0-4	1.17±1.41
Abortions	0-2	0.4±0.8
Curettage	0-1	0.07±0.21

GA. Gestational Age.

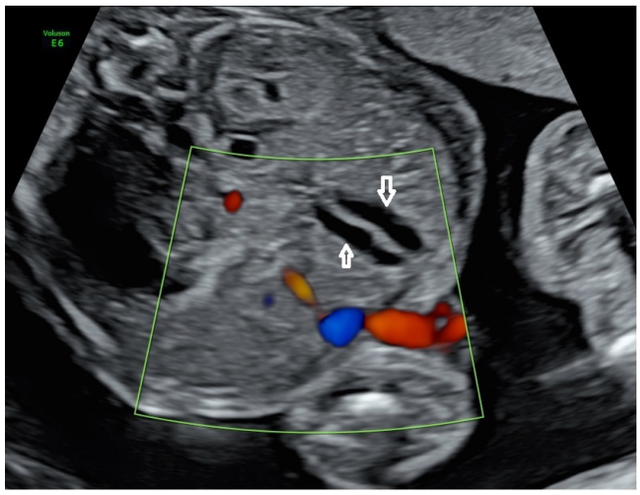

Figure 1. The gallbladder duplication of the fetus

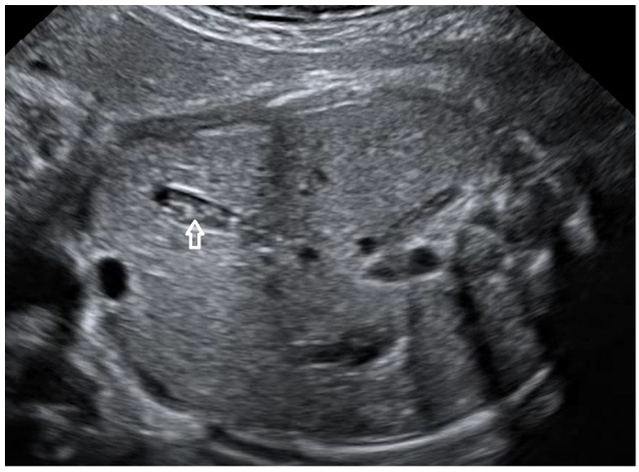

Figure 2. The bile sludge of the fetus

anomaly. The patients whose gallbladder could not be observed were called for follow-up at two-week intervals. In the case with 22 weeks of gestation, the gall bladder was visualized at the control examination two weeks later, and in the case with 24 weeks of gestation, the gallbladder was visualized at the control examination four weeks later. There was no case whose gallbladder could not be permanently visualized between the dates of the study.

Discussion

Since advances in ultrasound technology allow for a more detailed examination of the fetus, expanded fetal evaluation includes the evaluation of many fetal structures, including the gall bladder [1]. Fetal gall bladder examination is still not a part of standard fetal examination [9, 10]. However, with the accumulation of experience in this field, fetal gall bladder anomalies started to be examined more frequently, and an increasing number of studies on this subject appeared in the literature [7, 11, 12].

Gall bladder anomalies are rare and the frequency of anomalies is not clear. Studies have emphasized that it is 1 in 4000 and 1 in 875 births [3, 4]. In our study, the anomaly prevalence was found to be 2.3 per 1000 deliveries (0.23%). As the number of studied population increases, the frequency of detected anomalies is likely to increase. The fetal gallbladder develops in the fourth week of pregnancy from the caudal part of the foregut. At 12 weeks, bile production begins [13]. It can be monitored by ultrasound from the 13th week of pregnancy [5].

When the literature is reviewed, gallbladder anomalies are agenesis, biliary atresia, gallbladder sludge or stones, double gallbladder and the presence of aberrant gallbladder mostly located on the left [2, 12, 14, 15]. If the gallbladder is not observed during the fetal examination, the fetus should be followed up. Fortunately, in many cases, the gallbladder will be detected later. The gallbladder is a dynamic organ and has the ability to relax and contract [16].

During the period we conducted the study, the gallbladder was not observed in 1 fetus, and the presence of the gallbladder was confirmed in the control examination performed 10 days later. However, isolated agenesis or bile duct atresia should be kept in mind in the presence of a gallbladder that cannot be permanently monitored during intermittent examinations [17]. On the other hand, there is a risk of cystic fibrosis in these cases [8].

In the case of gallbladder anomalies, other structural and chromosomal anomalies should be investigated. This is especially true in cases where the gallbladder cannot be observed in successive examinations. In the study conducted by Shen et al., Trisomy 18 was found in one case, where the gallbladder could not be displayed persistently and Triploidy was found in another [6]. However, it is clear that there will be additional problems in many organ systems in both chromosomal anomalies. In the same study, isolated agenesis was detected in 1 case, and Cystic Fibrosis was detected in further evaluation, and pregnancy was terminated. A case of left isomerism among structural anomalies was also reported. In the study conducted by Yayla et al., structural anomalies as well as chromosomal anomalies were detected, and in 22.6% of these cases, fetal anomalies were detected. It has also been emphasized that as the severity of the anomaly increases, the frequency the gall bladder, which cannot be displayed increases [12].

All cases of stones or bile sludge that can be observed in the gallbladder have a good prognosis and usually disappear after one year of follow-up [7]. In our study, 1 case with bile sludge at 34 weeks of gestation was detected, and it did not cause any problems in the postpartum period.

Another gallbladder anomaly is duplications. The double gallbladder is a rare anatomic disorder of the biliary tract caused by the proliferation of 1 primordium or 2 primordia. Many cases are diagnosed in adulthood. It has been reported to occur in one in 4000 births [3]. Confirmation with postnatal magnetic resonance (MR) cholangiopancreatography is recommended [14]. Due to insufficient literature data, there is no clear information about the frequency of additional anomalies. In our 1 case, double gallbladder was detected, no additional anomaly was found, and the postpartum diagnosis was confirmed.

Limitations

Limiting factors of our study are the retrospective nature of the study and the small sample size.

Conclusions

In conclusion, gallbladder evaluation is part of extended fetal screening. Gallbladder anomalies appear as relatively rare and mostly benign anatomical variations. By informing the family,

it is ensured that appropriate follow-up in postnatal life is obtained.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest
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